SCIENCE RESEARCH COUNCIL

THE FUTURE OF THE ATLAS LABORATORY AND THE CONCEPT OF A
NATIONAL INSTITUTE FOR COMPUTING

Note by the Director of the Atlas Computer Laboratory

The Chairman's paper SRC 4-75 gives the position now reached as a
result of the discussion in the Computer Resources Panel and at a
meeting with members from the Department of Industry, the Atomic
Energy Authority and the Computer Board held on 31 December 1974. The
paper reports two developments of the greatest importance which have
occurred at a very late stage in the discussions of SRC's
computational needs and problems: the Engineering Board's proposal -
now being submitted to Council - to set up a national interactive
computing facility for engineers and the proposal from the Department
of Industry concerning a federal-type institute for computational
science and its applications. In both proposals Chilton is
recommended as the site and the Chairman's paper is written around the
further proposal that if Council approves the Engineering Board's
interactive project this is formed from the Atlas Laboratory and is
one of the components of the institute. I welcome all these proposals
with all the enthusiasm at my command and in particular I believe that
the proposed institute could be a national asset of very great value
and importance to both science and industry and a most exciting place
to work in. My purpose in writing this paper is to give my own views
on this institute, on the problems which would have to be solved in
setting it up and on the incorporation into it of the Atlas Laboratory.
They are my own personal views.

It is almost platitudinous to say that the digital computer is now
recognised as one of the most important inventions of all time. Science,
industry, commerce and a great deal of the activities of daily life
(think of credit cards) are completely dependent on computers; and the
production of these machines and their essential ancillaries has

become one of the world's leading industries in which the necessity for Britain to participate has become a firm part of Government policy. The fact that the computer is, apparently, universally applicable and infinitely exploitable is a consequence of the very fundamental, and essentially mathematical, nature of the digital computing process and the operations which go on in the machine. Technological developments have given huge increases in the raw speed and built-in logical power of computers, but developments in computational techniques and a deeper understanding of the formal basis of computer languages and processes have been equally important both in guiding these technological developments and in making use of the powers which they have provided. Thus whilst computing is an applied activity - always done in support of something else - it is sustained by a body of theoretical knowledge and techniques which is now called computer science, and which merits the name "science" because it possesses a considerable unity and coherence. In his contribution to the meeting on 31 December Dr Maddock emphasized the value which his Department saw in the interaction between academic and industrial interests in computers and computing in the proposed institute. I take the same view, and would add that this value is the greater, the greater the range of computational activities with which it is involved. There are underlying unities and any type of activity gains from an association with others. I should like to emphasize also the importance of a strong service commitment, which imposes very salutary disciplines on any research and development activity: my experience of running the Atlas Laboratory has convinced me completely of this.

The concept of the proposed institute is at this stage necessarily very broad. It is viewed as a federation of bodies each of which would be concerned with a fairly broad but reasonably well-defined field of computer science or application and each having some amount of autonomy. Present proposals for activities are: computer aided design (transferred by Department of Industry from Cambridge); communications - including network research and development - and numerical analysis (transferred by Department of Industry from the National Physical Laboratory); the SRC project for interactive services to engineers (to be formed from the Atlas Laboratory); and possibly a software production commitment to the Computer Board, also formed from the Atlas Laboratory or at least around an ACL nucleus. The institute's staffs and equipment

would be housed in the Atlas Laboratory building, which would be
extended as and when necessary. This building has of course been
designed specifically as a centre for computation and without any
extension at all - though possibly with some changes or additions to
the air-conditioning plant - can house a large amount of computing
machinery.

I have written all the above to lead up to the two main points which
I wish to make. The first concerns the work of the institute and
the implications of this for the re-grouping exercise. The engineering
interactive service will make large and varied demands on expertise,
quite apart from those related to the development of interaction-
oriented software. Graphics will be of very great importance,
including the use of computer-generated ciné film to aid the study
of complex time-varying processes, for example in fluid dynamics or
vibration of structures. There will be a need for efficient general
systems for storage, retrieval and processing of data. Large-scale
batch calculations will be needed as back-up to exploratory interactive
studies, and these will often need large general packages such as a
finite-element system. And as this is to be a national service, the
use of remote terminals and data links will be essential. The Atlas
Laboratory has expertise in all these fields; in computer graphics
in particular it has developed a powerful interactive system and with
the new FR80 micro-film recorder it will be outstanding in Europe. It
takes a long time to build up such skills and it seems to me essential
that what has been built up should be preserved in the new organisation.
Further, there are needs for these special technical services such as
interactive working, data-banking and graphics in very many fields,
and it would seem only sensible to exploit the skills and resources
built up in this institute by making the services widely available -
always, of course, with proper controls on access. The point I want
to make, and which I hope is made clear by the above, is that embarking
on what one might consider a restricted computational activity - in
this case, providing an interactive service for engineering - has very
wide-spreading consequences - essentially, because of the unity of the
subject to which I referred earlier; and that this should be considered
very carefully and seriously when deciding what part of the Atlas
Laboratory staff should remain at Chilton as part of the new institute.

The other point concerns management. Whilst, if I may repeat myself, I am wholeheartedly in support of this institute, I am conscious of considerable managerial problems. Just how is it run? At the start for certain, and probably for a long time, the people who form the various parts will be living in the same building, certainly sharing some administrative services and most certainly sharing some common computing and ancillary services. There are therefore questions of financing, of allocation of services and of control of and responsibility for staff, and some formal systems have to be set up for day-to-day management and for broad decisions on policy - how would a decision on a new major computer be reached, for example? There are many ways of operating such an institute. I think the extremes are:

(i) one body (say, the SRC) operates the whole institute and acts as contractor for various activities - for example, to Department of Industry for the computer-aided design work,

(ii) the various component parts belong to their respective parent bodies, with a campus-Director responsible for providing the common services and responsible to a Board of Management representing the interests of the participating organisations.

The point I want to make here is that I feel that it would be premature for SRC to make any decision on management at this stage, before a study of the general managerial question had been made. It would be most interesting to know how the problem has been tackled in some of the French or German federations to which Dr Maddock referred; and also - on a much bigger scale - in the National Institutes of Health at Bethesda (Washington DC), where there are 12 large institutes on a single campus - with a common computing service.

To conclude, my personal hope is that the Council will feel able to approve the principle of this proposed computational institute and will ask for detailed proposals on SRC participation, in particular on the incorporation of the Atlas Laboratory, to be submitted within a few months.

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